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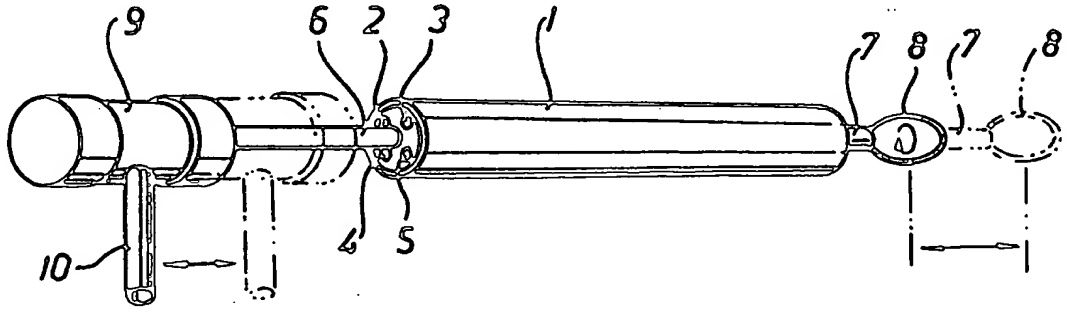

(57) Abstract

A surgical instrument for the treatment of in first hand the prostate gland. The instrument comprises mainly a tube (1) having channels (2, 3, 4, 5) for inspection, illumination, inflow of flushing liquid and for the removal of liquid and cut away tissue. The tube (1) contains a shaft (6) driven by a motor (9), said shaft, at its end to be inserted to the prostate gland, carrying a knife (8). The motor (9) is rotating the shaft (6) and causes the knife (8) to perform a rotating movement for the operative treatment of the prostate gland. The knife and the shaft may also be displaced relatively to the tube.

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A SURGICAL INSTRUMENT, PARTICULARLY FOR OPERATIVE TREATMENT OF THE PROSTATE GLAND

The present invention relates to a device for motorised endoscopical removal of tissue in a living body, particularly for operative treatment of the prostate gland, said device comprising a tube-shaped body having a handle, channels for inspection, illumination, influx of flushing liquid as well as removal of liquid and cut tissue and the like. Growth of the prostate gland happens to many human beings of the male sex, viz. 50% of all men in their sixties and 80% of the men in their eighties. When the prostate gland grows, the urethra is compressed and the discharge of the urine is rendered difficult and eventuelly completely impossible by complete clogging of the urethra. The growth varies in a very high degree, e.g. from some few grams to several hundred grams. For many decades of years these problems have been rectified by means of surgery and one has then used a U-shaped knife to scrape off or cut away tissue. The knife is attached to a tube-shaped implement having an inspection channel and a flushing channel. The knife is preferably conducting electricity so as to burn blood vessels in order to deminish the bleeding. This surgery has been carried out manually and is a technically very advanced operation requesting a delicate touch. A well trained surgeon could manage to remove a certain number of grams per time unit, thus a well trained and skilled operator could manage to remove about 1 gram per minute. An operation should for many reasons have a duration of no more than one hour, i.e. because the complications, that may occur, such as bleeding and resorption of flushing liquid, are related to the time of the operation and further the anaesthesia has a limited duration.

The aim of the present invention is to overcome the problems explained supra and to achieve this the invention is characterized by a shaft extending through the instrument body, said shaft rotated by a motor arranged at one end of the shaft such that a knife arranged at the opposite end of the shaft adapted to be moved axially in relation to the body, is brought to rotate for carrying out the surgical treatment.

Thereby high precision can be ensured in spite of a considerable increase of the speed at the carrying out of the operation in comparison with previously known technique. Further, the invention makes it possible to operate on very big prostate glands using endoscopic surgery which previously was not possible.

According to a further feature of the invention the shaft is electrically isolated from the instrument body, such that electric current may pass through the shaft to the knife so as to facilitate the cutting and stop the bleeding. It is preferable to include a safety switch so as to prevent too deep a cutting. The body is certainly provided with an evacuation channel for the removal of liquid and cut tissue but it might nevertheless be of advantage to provide another channel for the same purpose preferably in addition to the channel in the instrument body. The flushing liquid may be injected continuously why the quantity of such liquid could be rather important and furthermore urine may be added to the bladder and has to be removed.

At the operation there is a risk of bleeding which causes a red colouring of the drainage liquid. This may be used as a warning and via an electronic circuit be used to stop the motor.

The invention will now be described more in detail with reference had to the accompanying drawings. In the drawings:

FIG 1 is a perspective view of the device according to the invention;

FIG 2 is an end view of the body of the instrument with a knife and a safety switch;

FIG 3 is a broken side elevation of the same part of the instrument;

FIG 4 shows the instrument body with the motor arranged inside the same;

FIG 5 shows the connection of the motor to the shaft in the body by means of a flexible shaft;

FIGS 6 and 7 are views in different directions of a more detailed embodiment of the instrument according to the invention; and

FIG 8 shows a further embodiment of the invention.

The instrument shown in Fig 1 and intended for surgical treatment in the first place of the prostate gland comprises a body 1 having four channels 2, 3, 4 and 5 for inspection, illumination, inflow of flushing liquid and for removal of liquid and cut tissue. Extending through the body 1 is a shaft 6 carrying on its end 7 extending out from the end of the instrument body 1 and according to the embodiment shown in Fig. 1 a cutting tool in i.e. a knife in the shape of a loop 8. At its other end the shaft 6 carries, according to the embodiment shown in Fig. 1, a motor 9 having on its mantle a handle 10 attached thereto. This operation tool functions such that when the body 1 has been inserted through the urethra to such an extent that the knife 8 is situated at the prostate gland, the motor 9 is started. The shaft 6 is then brought to rotate and makes the knife 8 to rotate so as to cut a layer of the prostate gland. By means of the handle 10 the motor 9 with the shaft 6 and the knife 8 can be shifted as indicated whereby tissue is removed along the whole of the prostate gland. This sliding movement in the sleeve-shaped body means that fretting of the sleeve against sensitive tissue is avoided. The cutting operation can during the whole process be watched through the

inspection channel 2 and flushing can be performed through the channels 4 and 5. Electrical current can easily be led through the knife and thereby bleeding can be stopped by burning of blood vessels. This surgical instrument thus makes it possible to carry out the operation in a very short time which means not only an increased efficiency and improved productivity of the surgeon but also less strain on the patient which must be considered as being of a very special importance.

In Figs. 2 and 3 there is shown the end portion of the instrument body 1 with the knife 8. In these Figs. there is shown how too deep a cutting may be prevented by the arrangement of a safety switch 11 which is detecting if the knife 8 should sink to an unpermissible depth. In such a case the end of the instrument body 1 will be lowered such that the loop 11, i.e. the safety switch is swung about its fulcrum 12 to influence a contact means 13 so as to cut the current to the motor 9 and thus interrupt the cutting of the prostate gland.

In Fig. 4, the motor 9 is shown arranged interiorly of the instrument body 1 and in Fig. 5 there is shown how the motor 9 may be arranged outside the instrument body 1 and connected to the shaft 6 by means of a flexible shaft 14.

The previous Figs. 1 - 5 have had for their purpose to show the invention principally. In Figs. 6, 7 and 8 there is shown a concrete embodiment of the instrument according to the invention. This instrument shows at its upper - according to the drawing - and an inspection glass 15 and a connection 16 to a source of light (not shown).

The inspection glass 15 further carries a thumb grip 17 and as a counterstay the instrument has been provided with a finger grip 36 such that the surgeon with one hand may bring the instrument into the position where the knife is ready for cutting while holding the instrument steadily. A motor, not shown, is coupled to the flexible shaft 18 which via a gear 19 transmit a rotating movement

to the shaft 20 and thus to the knife 8 as well so as to carry out the operative treatment of the prostate gland. The instrument further has a connection 21 for flushing liquid for the removal of cut tissue and of urine.

Fig. 8 shows a further embodiment of the operation instrument according to the invention. Also in this case the instrument is provided with an inspection glass 15 with a connection 16 to a source of light, not shown. The inspection glass 15 is in this embodiment attached to the instrument by means of a bayonet clutch 22. As is the case in previously described embodiments also in this case there has been arranged a connection 16 to a source of light.

The instrument has a central body 22, a gear 23 being arranged in said central body 22. This gear 23 is driven by a motor 24 which in turn is manoeuvered by means of a pedal 25 having an electrical connection plug 26. The motor 24 can be connected to the gear 23 by means of a bayonet clutch 27. The gear 23 drives a shaft 29 arranged in a mantle or guiding tube 28, said shaft 29 carrying at its outer end the operation knife 8. The shaft 29 comprises a tube and is housing an optical tube 30 which at its - in a way of speaking - end is provided with an optical device 31 which makes it possible for the surgeon to watch the activity of the knife 8. The guiding tube 28 also has a connection 31 for the inflow of flushing liquid and one connection 32 for the removal of the flushing liquid. Between the different tubes in the guiding tube 28 interspaces are formed which can be used for conducting flushing liquid to the operation area and be removed together with urine and cut away tissue. The guiding tube 28 can as shown be connected in a proper manner by means of a bayonet clutch 33 and a liquid seal 34 ensures then that flushing liquid is prevented from leaking out at the inner end of the guiding tube 18. This embodiment of the instrument according to the invention has a cable 35 for the feeding of electricity serving to increase the cutting ability of the knife 8 and to stop the bleeding.

The invention is not restricted to the shown and described embodiments but many modifications are possible within the scope of the appended claims. Thus, the intercoupling of the parts of the instrument may be carried out in another way than shown by means of bayonet clutches. Neither are the arrangements of the connections for the inflow of light and flushing liquid in any way restriced to the shown embodiments. Also other details may be modified in an effort to adopt them to different needs as the essential idea of the invention is to provide an instrument which thanks to its very special construction makes it possible to carry out the surgical treatment of the prostate gland in a considerably shorter time and by means of a less tiring work than has previously been possible for a surgeon. Further the treatment is safer as regards the patient. It is also possible to operate on a bigger prostate gland than what has been possible by means of endoscopic surgery. The knife may have another form than the one shown in the drawings and described supra. For instance, the knife may be composed of blades extending from the shaft. It can also be replaceable.

However, it is important that the surgeon can look through the rotating knife. It may also be of importance to adapt the rotation speed of the knife to the frequency of the light.

Instead of being rotated continously in one direction the knife may be rotated alternately in both directions parts of one rotation or several rotations in either direction.

The endoscopic channel and other tubes may be completed or be replaced by means of video techniques.

CLAIMS

1. A device for motorized, endoscopic removal of tissue from a living body, in particular for operative treatment of the prostate gland, said device having a tube-shaped body which is provided with a handle, channels for inspection, illumination, introduction of flushing liquid and for the removal of liquid and cut tissue, c h a r a c t e r i z e d by a shaft extending through said instrument body and adapted to be rotatively driven as well as for performing an oscillary movement, by a motor at one end of said shaft such that a knife at the other end of the shaft is given a rotating movement for performing the operative treatment, said knife being axially displaceable by means of said handle.

2. A device as claimed in claim 1, c h a r a c - t e r i z e d by the fact that the shaft is electrically isolated from the instrument body such that electrical current may be passed through the shaft to the knife so as to facilitate the cutting and stop bleeding.

3. A device as claimed in claim 1 or 2, c h a r - a c t e r i z e d by a safety switch which is preventing too deep a cutting (Fig 2).

4. A device as claimed in any of the preceeding claims, c h a r a c t e r i z e d by a tube or the like forming a separate drainage channel and adapted to be introduced to the organ from which tissue is to be removed e.g. the bladder, said tube or the like completing or replacing the drainage channel in the body.

5. A device as claimed in anyone of the claims 1 - 4, c h a r a c t e r i z e d by the fact that the motor driving the shaft, said motor being of electrical, pneumatical or hydraulical nature, is arranged in the interior of or in the near vicinity of the tube-shaped body or connected to said body by means of a flexible shaft.

6. A device as claimed in any one of the preceeding claims, c h a r a c t e r i z e d by an electronic safety circuit arranged to stop the motor when bleeding causes a red colouring of the flowing liquid.

7. A device as claimed in any one of the preceeding claims, c h a r a c t e r i z e d by the fact that the knife is replaceably arranged on the shaft.

8. A device as claimed in any one of the preceeding claims, c h a r a c t e r i z e d by the fact that the knife is transparent when rotated.

9. A device as claimed in claim 8, c h a r a c - t e r i z e d by the fact that so as to increase the transparency of the knife the rotation speed of the same is chosen such that the movements of the knife blade deviates from the frequency of the light.

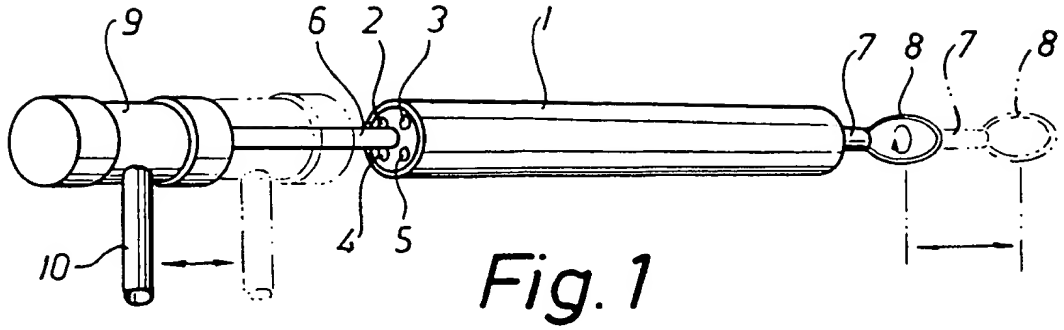


Fig. 1

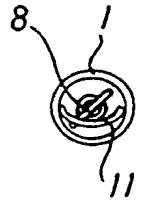


Fig. 2

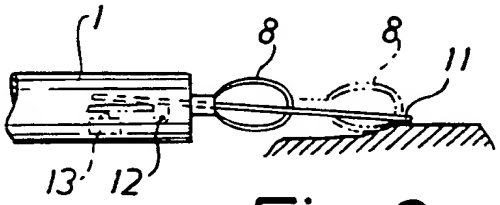


Fig. 3

Fig. 4

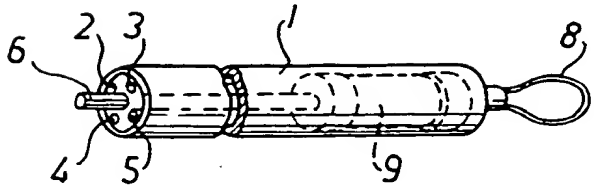
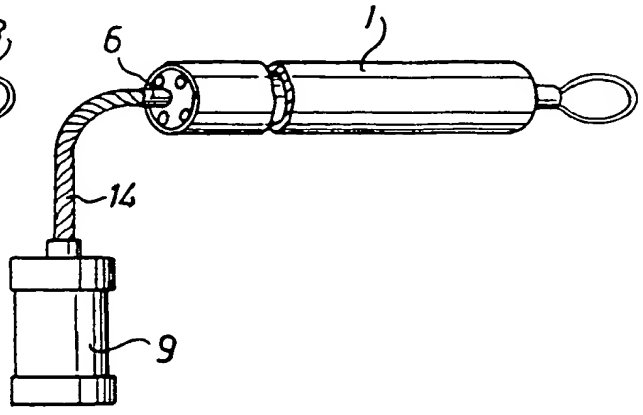


Fig. 5



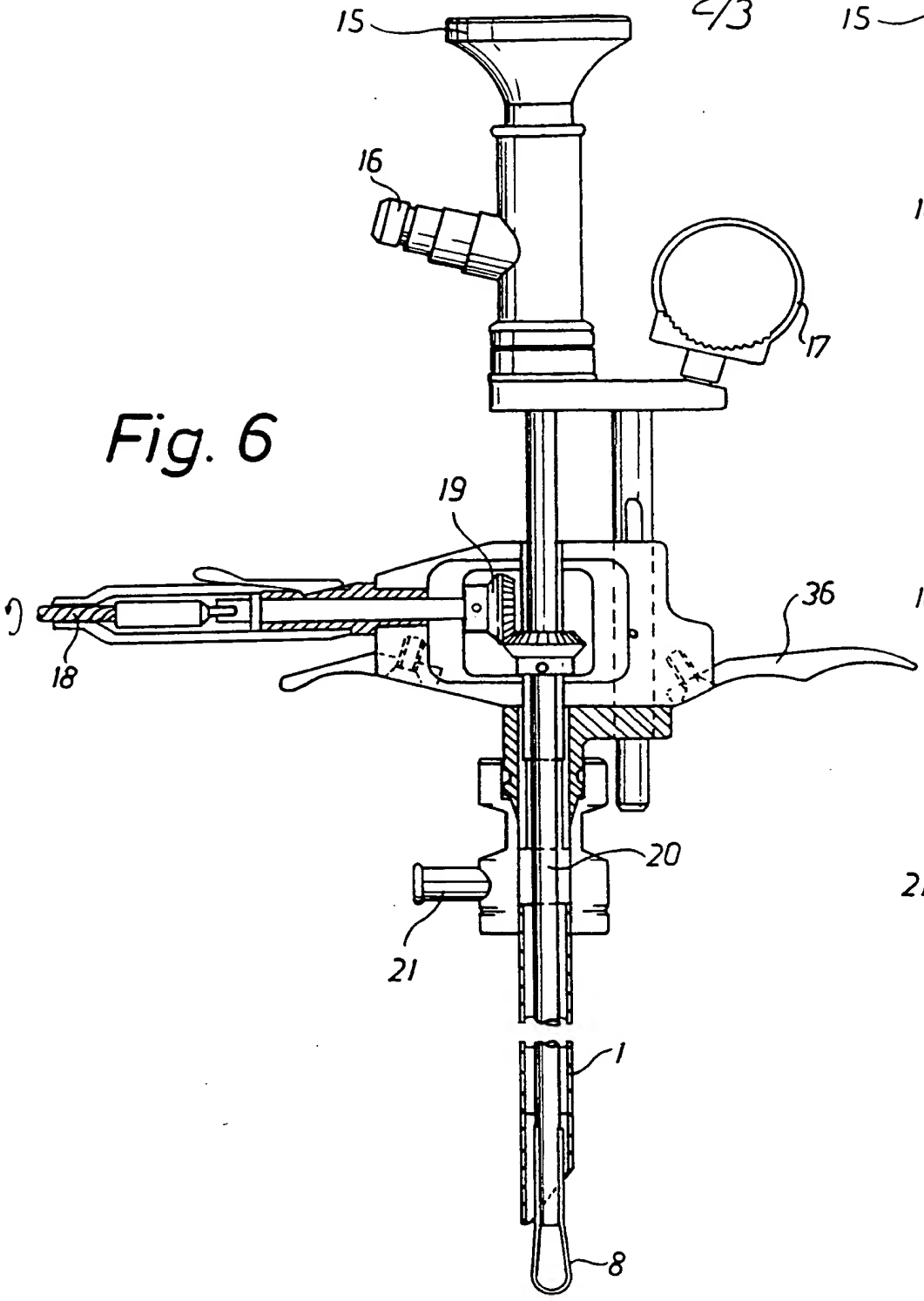


Fig. 6

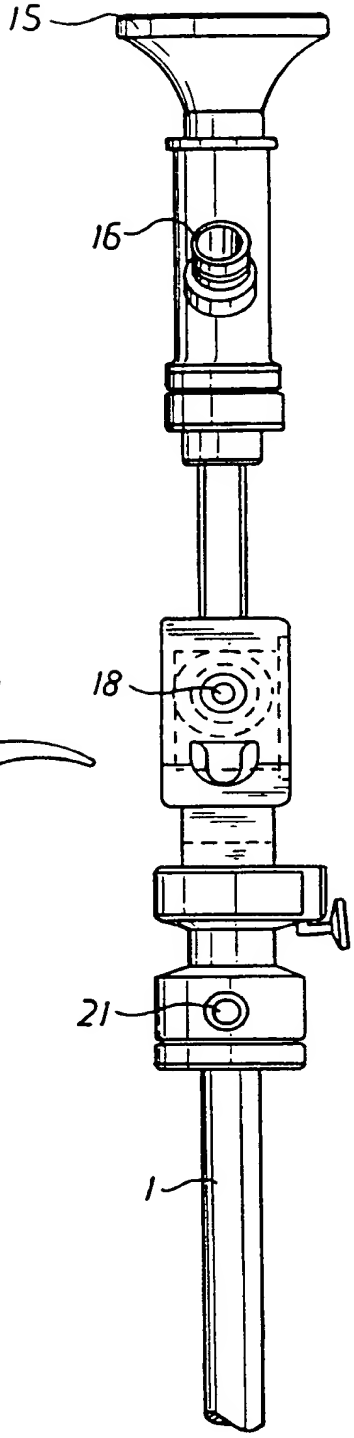


Fig. 7

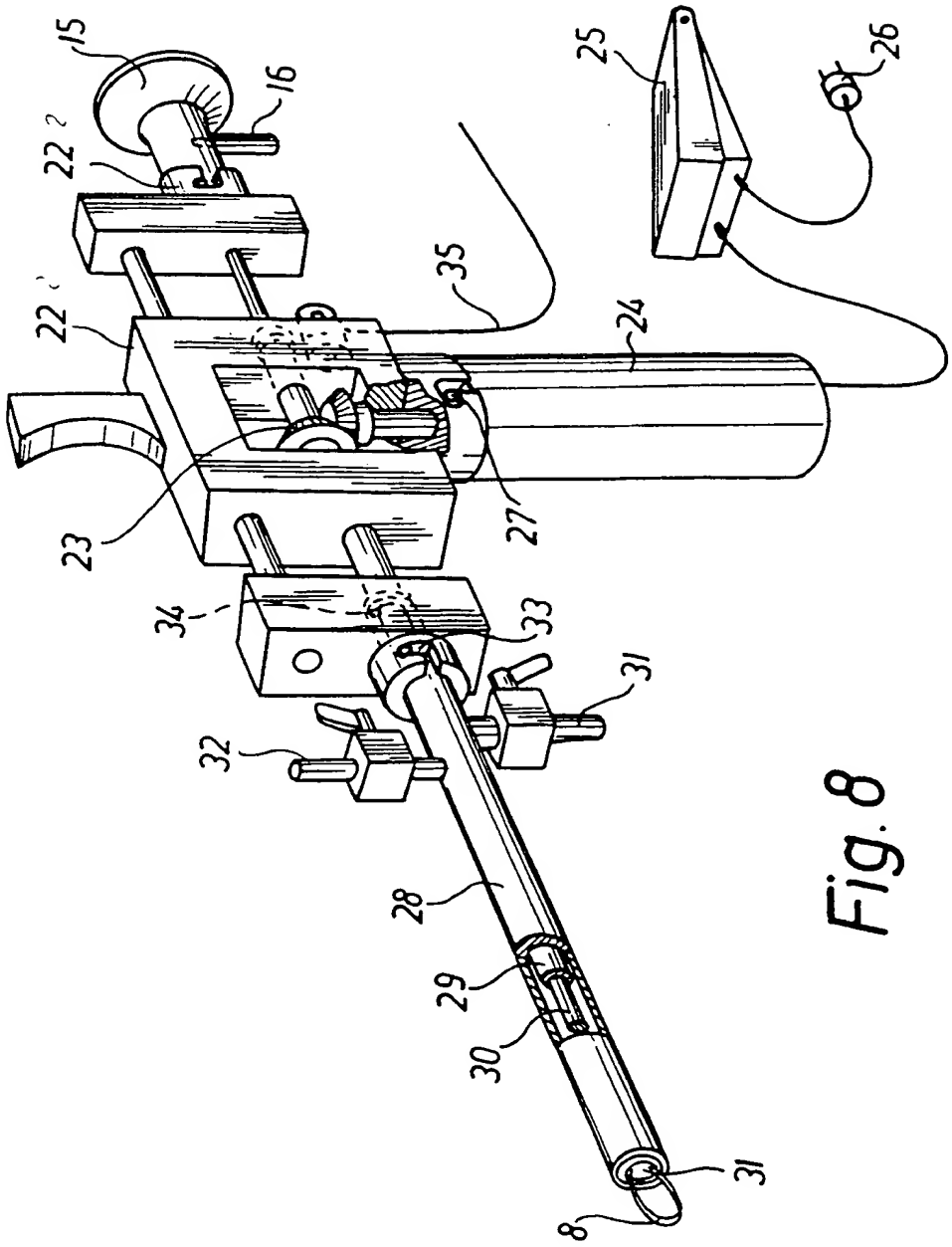


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 94/00413

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A61B 17/32, A61B 17/38, A61B 17/39
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, A1, 3339322 (KOLLIAS, G.), 3 May 1984 (03.05.84), figures 1,3, abstract --	1-9
A	US, A, 5133713 (J.-K. HUANG ET AL), 28 July 1992 (28.07.92), figures 1-4, abstract --	1-9
A	US, A, 2448741 (W.W. SCOTT ET AL), 7 Sept 1948 (07.09.48), column 4, line 58 - line 66 --	1
A	US, A, 4423727 (J. WIDRAN ET AL), 3 January 1984 (03.01.84), abstract --	1

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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X,E	SE, A, 9203375 (AB CHRISTER DAHLSTRAND), 13 May 1994 (13.05.94), the whole document -- --------	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

26/11/94

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A1- 3339322	03/05/84	NONE	
US-A- 5133713	28/07/92	EP-A- 0448857	02/10/91
US-A- 2448741	07/09/48	NONE	
US-A- 4423727	03/01/84	AU-A- 8332082	04/11/82
		CA-A- 1177350	06/11/84
		EP-A,B- 0076302	13/04/83
		SE-T3- 0076302	
		WO-A- 8203545	28/10/82
SE-A- 9203375	13/05/94	NONE	